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(19)

(54) IMPROVEMENTS RELATING TO DISC BRAKES

(71) We, GIRLING LIMITED, a British Company, of Kings Road, Tyseley, Birmingham, 11, do hereby declare the invention for which we pray that a Patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to improvements in disc brakes of the kind in which a friction pad assembly is adapted to be applied to one side of a rotatable disc by a support which may comprise a piston in the case of a directly actuated pad assembly and a part of a caliper or clamping member in the case of an indirectly actuated pad assembly.

Disc brakes are liable to squeal under certain conditions, and various attempts have been made to prevent this by modification of the mounting and application of the friction pad assemblies. For example, in brakes of the floating caliper type it has been proposed to clamp the outboard friction pad assembly to the caliper, and in brakes of the fixed caliper opposed-cylinder type it has been proposed to offset the engagement between a piston and a friction pad assembly.

Furthermore, in our British Patent No. 925294 we have described and claimed a disc brake in which, for the purpose of eliminating or reducing squeal, there is interposed between the friction pad assembly and an hydraulically actuated piston a shim of which a part is cut out over a portion of what would normally be the area of contact between the piston and the friction pad assembly, whereby when the piston is pressurised it applies a thrust to the backing plate only over the remainder of that area.

According to our invention in a disc brake of the kind set forth a strip of material coated on both sides with a layer of adhesive is interposed between the friction pad assembly and the support to locate the friction pad assembly without actually clamping it and restrict the damp relative movement, radial or circumferential, between the pad assembly and the support.

By attaching the pad assembly to the support, the vibrating mass is increased. This modifies the vibration frequency of the pad assembly by reducing it to a lower and less audible level.

The strip may comprise a single strip of metal. Alternatively the strip may be of laminated construction provided with at least two separate metal layers interconnected by resilient material. Such a construction damps out and prevents amplification of high frequency vibrations.

The adhesive employed is such that the bond formed by the adhesive between the friction pad assembly and the support is sufficient to prevent relative movement of the pad assembly in use but is not so great as to prevent withdrawal of the pad assembly when the pad assembly has to be replaced.

Suitable adhesives are available on the market, a particularly suitable adhesive being based on uncured rubber embedded in silk.

In the initial assembly of the brake at a factory the coated strip may be supplied in the form of a roll from which appropriate lengths are cut off automatically during assembly.

A suitable material for the strip is aluminium, but various other metals or alloys may be employed.

When the strip comprises a shim having a cut-out and the support comprises a piston working in an hydraulic cylinder the cut-out is so constructed and arranged that when the pad assembly is in its position of use in the brake the centre of area of the engagement between the piston

and the pad assembly lies on the side of the axis of the piston opposite to that, with which any given point on the brake disc first comes into alignment in the normal forward direction of disc rotation.

The shim may be so shaped that it can only be inserted the right way round, or it may carry a marking, such as an arrow, to ensure that it is fitted correctly.

Some embodiments of our invention are illustrated in the accompanying drawings in which:—

Figure 1 is a transverse section through a metal locating strip;

Figure 2 is a section similar to Figure 1 of a strip of laminated construction;

Figure 3 is a section through an hydraulic piston with a locating strip attached to it;

Figure 4 is a yoke of a disc brake provided with a locating strip;

Figure 5 is a section through a part of an hydraulically-operated disc brake with a locating strip interposed between an hydraulic piston and a friction pad assembly;

Figure 6 is a side elevation of a friction pad assembly with a locating strip attached thereto;

Figure 7 is a view similar to Figure 6 of a locating strip of different configuration;

Figure 8 is a view similar to Figure 6 including a pair of locating strips;

Figure 9 is another view similar to Figure 6 but including yet another configuration of locating strip;

Figure 10 is a plan of a disc brake;

Figure 11 is a view on an enlarged scale of a part of the disc brake; and

Figure 12 is a side elevation of shim for use in the disc brake of Figures 10 and 11.

The locating strip 1 illustrated in Figure 1 comprises a strip 2 of a substantially incompressible material, suitably a metal, for example aluminium, coated on both side faces with a layer of adhesive 3. Conveniently the strip comprises a length cut from a roll as required with the coated faces protected by "peel-off" layers of oiled paper 4. The adhesive may be of any commercially available type but an adhesive based on uncured rubber embedded in silk is particularly suitable.

In the modified construction illustrated in Figure 2 the metal strip 2 is of laminated construction comprising two metal layers 5 which are interconnected by resilient material 6 which may comprise an additional layer of adhesive. The outer faces of the metal layers are coated as before with the layers of adhesive 3 which, in turn, are protected by the "peel-off" layers.

The locating strip 1 is adapted to be installed in a vehicle disc brake of the kind in which a friction pad assembly is adapted to be applied to one or each side of a rotatable disc by a support with the strip 1 interposed between the pad assembly and the support.

As illustrated in Figure 3 the support comprises an hydraulic piston 7 adapted to work in an hydraulic cylinder of the disc brake to apply a friction pad assembly directly to an adjacent face of the disc. The strip 1 is applied directly to the piston during assembly of the brake after removal of one of the "peel-off" layers so that the strip is attached to the piston by the adhesive. The other "peel-off" layer is removed before the pad assembly is inserted into the brake so that the piston 7 is secured to the pad assembly by means of the locating strip.

In the construction of Figure 4 the support comprises a yoke 8 having opposed interconnected portions 9 and 10 disposed on opposite sides of the disc. The yoke 8 is slidably guided for axial movement in a stationary member in a direction to apply the brake in response to operation of actuating means. The actuating means act on the portion 9 in a direction to urge the portion 10 towards the disc. This indirectly urges a friction pad assembly into engagement with the disc. As illustrated the locating strip 1 is normally applied to the portion 10 and is received within a recess 11 in which the indirectly actuated friction pad assembly is at least partially received to locate it at least substantially against movement in a circumferential direction with respect to the yoke.

In the embodiment of Figure 5 the support again comprises the hydraulic piston 7 for applying a friction pad assembly 12 to a rotatable disc. The friction pad assembly 12 comprises a rigid backing plate 13 carrying on one face a pad 14 of friction material and the locating strip 1 is housed within a recess 15 in the other face of the backing plate.

The locating strip 1 and the recess 15 may be of any convenient complementary outline. For example, as shown in Figure 6, the strip 1 and the recess 15 are circular. In Figure 7 the recess comprises a transverse slot.

In another construction illustrated in Figure 8 strips 1 are applied diagonally to a planar face of the backing plate 13 so that the piston 7, shown in chain dotted outline, acts on the pad assembly only over four angularly spaced contact areas 16.

In the construction shown in Figure 9 a single strip 1 is applied to a planar face of the backing plate 13 for engagement by the support portion 10 of the yoke 8.

The disc brake illustrated in Figures 10 to 12 comprises a caliper 17 of generally U

outline straddling a portion of the peripheral edge of a rotatable disc not shown. Friction pad assemblies 18 for engagement with opposite faces of the disc are guided in the caliper 17 for movement towards and away from the disc and are adapted to be applied to the disc by opposed pistons 19 working in hydraulic cylinders 20 in the caliper 17. Each friction pad assembly 18 comprises a pad of friction material 21 carried by a rigid backing plate 22, and there is interposed between each piston 19 and each backing plate a shim 23. A part 24 of each shim is cut out over a portion of what would normally be the area of contact between each piston 19 and the backing plate 22 on which it acts so that when the pistons are pressurised they apply thrust to the backing plate 22 only over the remainder of those areas. The shim 23 comprises a metal strip 2 which may be either a single member as illustrated in Figure 1 or of laminated construction as shown in Figure 2. In both cases the strip is coated with the adhesive layers 3 to locate the pad assemblies 18 and restrict and damp any relative movement, radial or circumferential between the pistons 19 and the pad assemblies 18.

As shown in Figure 12 the shim 23 may be shaped to fit into the brake, and it may carry marking such as an arrow 25 to ensure that it is fitted correctly.

WHAT WE CLAIM IS:—

1. A disc brake of the kind set forth in which a strip of material coated on both sides with a layer of adhesive is interposed between the friction pad assembly and the support to locate the friction pad assembly without actually clamping it and restrict and damp relative movement, radial or circumferential between the pad assembly and the support.

2. A disc brake as claimed in Claim 1, in which the strip comprises a single strip of metal.

3. A disc brake as claimed in Claim 1, in which the strip is of laminated construction comprising at least two separate metal layers, and resilient material interconnecting the metal layers.

4. A disc brake as claimed in any of Claims 1 to 3, in which the adhesive employed is such that the bond formed by the adhesive between the friction pad assembly and the support is sufficient to prevent relative movement of the pad assembly in use but is not so great as to prevent withdrawal of the pad assembly when the pad assembly has to be replaced.

5. A disc brake as claimed in any preceding claim in which the adhesive includes uncured rubber embedded in silk.

6. A disc brake as claimed in any preceding claim in which the coated strip is adapted to be protected on opposite sides by protective layers which are removed before the strip is inserted into the brake.

7. A disc brake as claimed in Claim 6, in which the protective layers comprise layers of oiled paper which are adapted to be "peeled off".

8. A disc brake as claimed in any preceding claim, in which the coated strip is cut from a roll.

9. A disc brake as claimed in any preceding claim in which the pad assembly comprises a friction pad carried by one face of a rigid backing plate and the strip is received within a recess in the other face of the backing plate.

10. A disc brake as claimed in any of Claims 1-8 in which the strip comprises a shim having a cut-out so constructed and arranged that when the pad assembly is in its position of use in the brake the centre of area of the engagement between the support, which comprises a piston, and the pad assembly lies on the side of the axis of the piston opposite to that with which any given point on the brake disc first comes into alignment in the normal forward direction of disc rotation.

11. A disc brake as claimed in any of Claims 1-9, in which the support comprises an hydraulic piston working in an hydraulic cylinder.

12. A disc brake as claimed in any of Claims 1 to 8, in which the support comprises a portion of a yoke which acts on the friction pad assembly to urge it into engagement with the disc in response to operation of actuating means acting on another portion of the yoke disposed on the opposite side of the disc.

13. A disc brake of the kind set forth incorporating a locating strip substantially as described with reference to and as illustrated in Figure 1 of the accompanying drawings.

14. A disc brake of the kind set forth incorporating a locating strip substantially as described with reference to and as illustrated in Figure 2 of the accompanying drawings.

15. A disc brake of the kind set forth having an hydraulic piston provided with a locating strip substantially as described with reference to and as illustrated in Figure 3 of the accompanying drawings.

16. A disc brake of the kind set forth incorporating a yoke provided with a locating strip substantially as described with reference to and as illustrated in Figure 4 of the accompanying drawings.

17. An hydraulically-operated disc brake substantially as described with reference to and as illustrated in Figure 5 of the accompanying drawings.

18. A disc brake of the kind set forth

incorporating a friction pad assembly substantially as described with reference to and as illustrated in Figure 6 of the accompanying drawings.

19. A disc brake of the kind set forth incorporating a friction pad assembly substantially as described with reference to and as illustrated in Figure 7 of the accompanying drawings.

20. A disc brake of the kind set forth incorporating a friction pad assembly substantially as described with reference to and as illustrated in Figure 8 of the accompanying drawings.

21. A disc brake of the kind set forth incorporating a friction pad assembly substantially as described with reference to and as illustrated in Figure 9 of the accompanying drawings.

22. A disc brake for a vehicle substantially as described with reference to and as illustrated in Figures 10 and 12 of the accompanying drawings.

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4 SHEETS

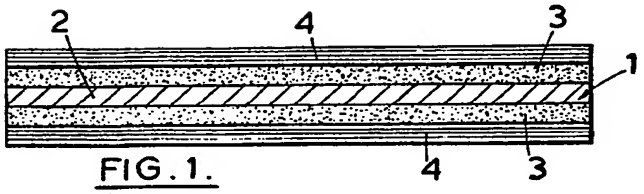

FIG. 1.

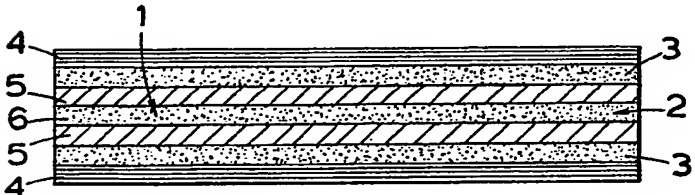

FIG. 2.

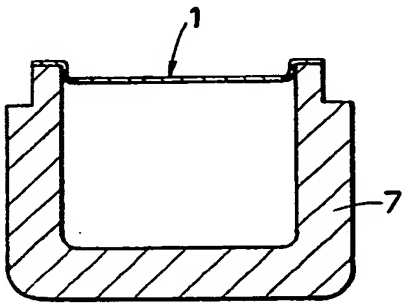

FIG. 3.

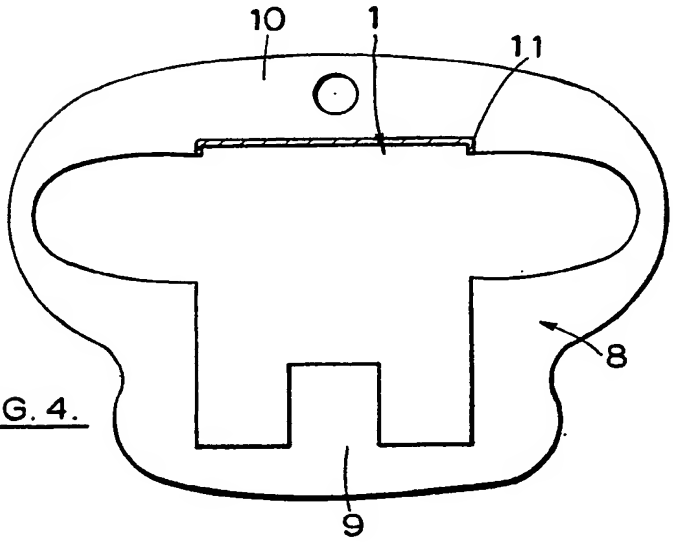

FIG. 4.

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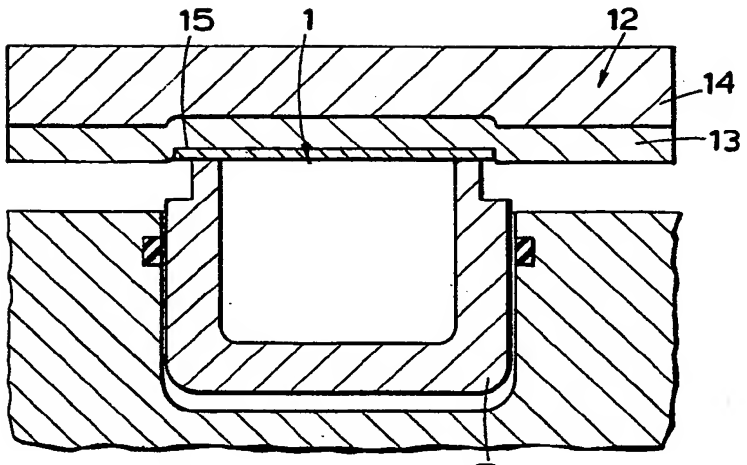

FIG. 5.

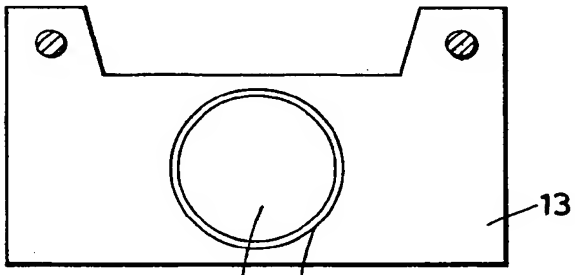

FIG. 6.

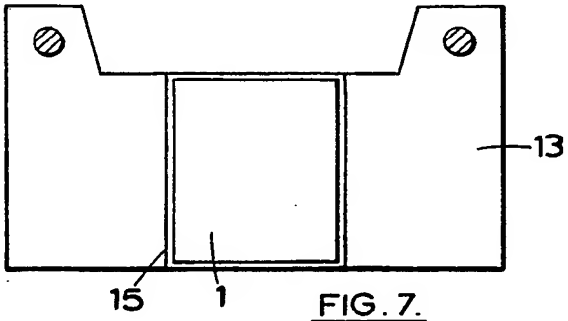

FIG. 7.

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SHEET 3

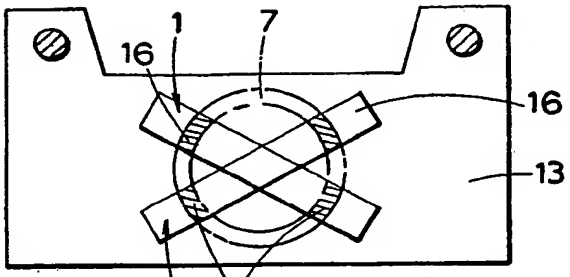

FIG.8.

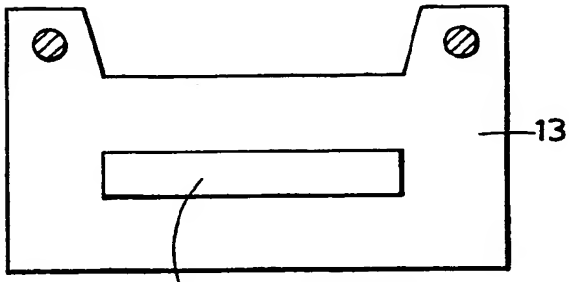

FIG.9.

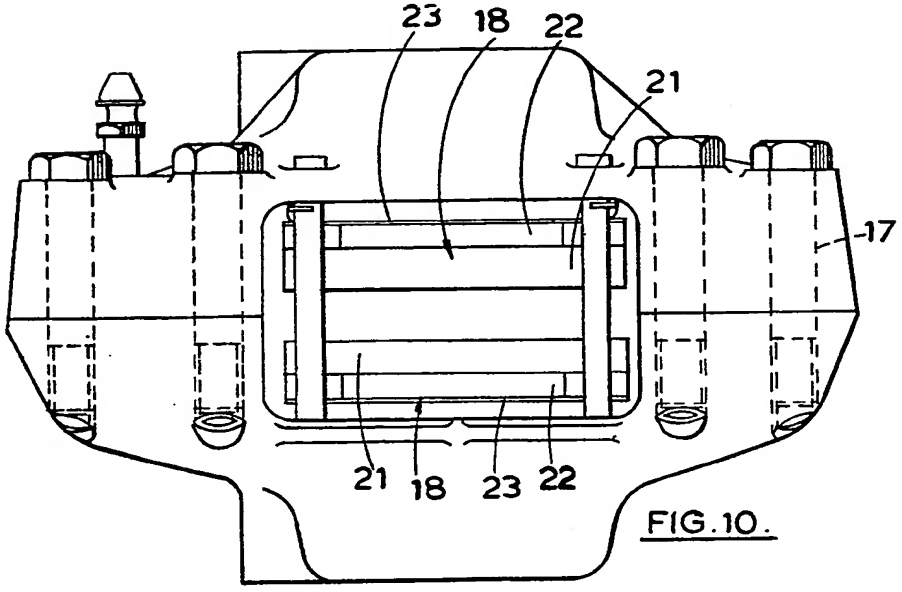

FIG.10.

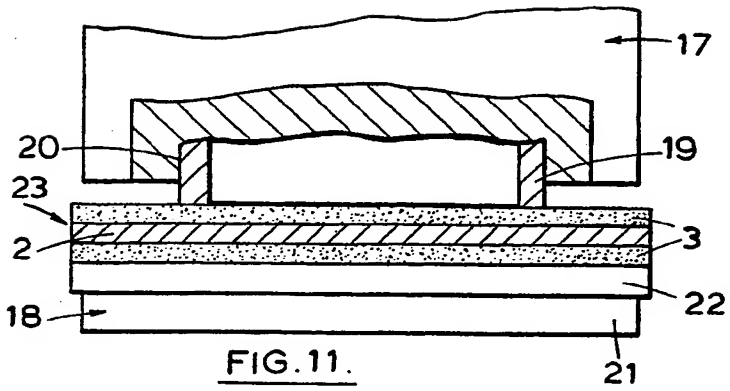

FIG. 11.

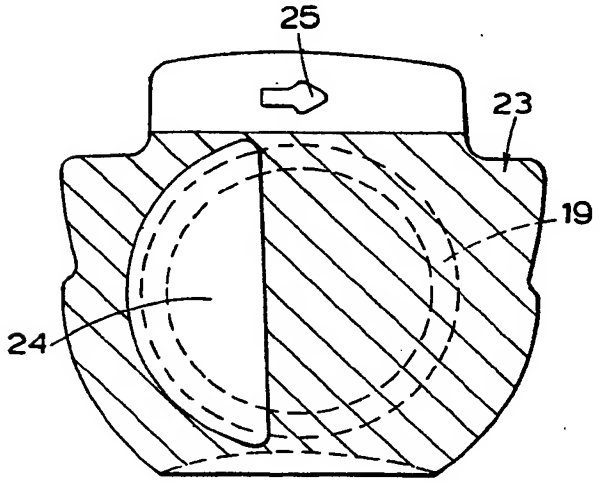

FIG. 12.